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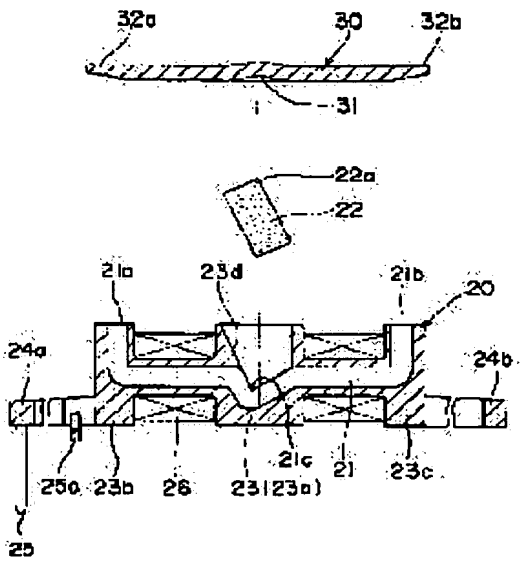
(54) ELECTROMAGNETIC RELAY

(57)Abstract:
PURPOSE: To provide an electromagnetic relay the component parts of which are easy to manufacture and the operating characteristics of which are uniform.
CONSTITUTION: A positioning recessed portion 21c of roughly triangular cross section is formed by curving the center portion of an iron core 21 of roughly U-shaped cross section. A portion of the center portion 23a of a spool 23 with which the iron core 21 is insert molded is recessed 23c. A permanent magnet 22 of rectangular cross section is fitted into the recessed portion 21c of the iron core 21 which is located on the bottom face of the recessed portion 23c. An engagement groove 31 provided on the lower surface of a moving iron core 30 is engaged with the corner portion 22a of the permanent magnet 22 so that the moving iron piece 30 is rotatably supported.



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CLAIMS

[Claim(s)]

[Claim 1] The electromagnetic relay characterized by supporting moving iron to the corner of the permanent magnet which leaned and attached moving iron to said iron core in the electromagnetic relay supported free [rotation] at the permanent magnet of the cross-section rectangle attached to the iron core, enabling free rotation.

[Claim 2] The electromagnetic relay according to claim 1 characterized by having engaged with the corner of said permanent magnet and supporting the engagement slot established in one side of said moving iron free [rotation].

[Claim 3] The electromagnetic relay according to claim 1 or 2 characterized by fitting the corner of said permanent magnet into the crevice for positioning of a cross-section abbreviation triangle established in one side of said iron core.

[Claim 4] An electromagnetic relay given in claim 1 characterized by supporting moving iron free [rotation] through the thin meat material which covers the corner of said permanent magnet thru/or any 1 term of 3.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the mounting structure of an electromagnetic relay and the permanent magnet which constitutes a magnetic circuit especially.

[0002]

[Description of the Prior Art] Conventionally, as a magnetic circuit of an electromagnetic relay, as shown in drawing 7 , for example By laying the support projected part 4 of moving iron 3 in the top-face center section of the permanent magnet 2 arranged on the center section of the abbreviation KO typeface iron core 1, supporting free [rotation], and impressing and exciting an electrical potential difference in the coil 5 wound around said iron core 1 Said moving iron 3 is rotated and there is a thing the both ends 3a and 3b were made to attach and detach by turns to the both ends 1a and 1b of said iron core 1. In addition, in the above-mentioned electromagnetic relay, in order to consider as a self-reset mold, by bending horizontally end section 1a of said iron core 1, adsorption areas were made to differ and magnetic balance is lost.

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[0003]

[Problem(s) to be Solved by the Invention] However, in the above-mentioned electromagnetic relay, end section 1a of an iron core 1 must be horizontally bent to accuracy, and manufacture takes time and effort. Especially, along with the miniaturization of equipment, the above-mentioned bending processing becomes it is remarkable and difficult, it is easy to produce variation for components precision, and there is a trouble that this has an adverse effect on an operating characteristic.

[0004] In view of said trouble, manufacture of a component part is easy for this invention, and it aims at offering an electromagnetic relay with a uniform operating characteristic.

[0005]

[Means for Solving the Problem] In the electromagnetic relay supported for moving iron to the permanent magnet of the cross-section rectangle attached to the iron core, enabling free rotation, moving iron is supported for the electromagnetic relay concerning this invention to the corner of the permanent magnet leaned and attached to said iron core, enabling free rotation in order to attain said object. Moreover, said moving iron may engage with the corner of said permanent magnet, and may support the engagement slot established in the one side free [rotation]. Furthermore, said iron core may fit in and attach the corner of said permanent magnet to the crevice for positioning of a cross-section abbreviation triangle established in the one side. And said moving iron may be supported free [rotation] through the thin meat material which covers the corner of said permanent magnet.

[0006]

[Function] Therefore, according to claim 1 concerning this invention, moving iron will rotate the corner of the permanent magnet of a cross-section rectangle at the supporting point. Moreover, according to claim 2, moving iron will be supported free [rotation] through the engagement slot which engages with the corner of said permanent magnet. Furthermore, according to claim 3, a permanent magnet will be attached to the crevice for positioning of a cross-section abbreviation triangle established in the iron core with a predetermined inclination. And according to claim 4, moving iron will be supported by the corner of a permanent magnet free [rotation] through thin meat material.

[0007]

[Example] Next, the example concerning this invention is explained according to the accompanying drawing of drawing 1 thru/or drawing 6 R> 6. The electromagnetic relay concerning the 1st example consists of the moving iron 30 which constitutes a profile,

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the base 10, the electromagnet block 20, and the movable block 80, the insulating frame 40, the load spring 50 and movable contact segment block 60, and a case 70, as shown in drawing 1 thru/or drawing 4 .

[0008] While the base 10 has a flat-surface abbreviation rectangle and carries out insert molding of the stationary-contact terminal 11 and the contact common terminal 13 to the lot [every] symmetry It is what was pressed fit from the upper part so that the stationary-contact terminal 12 of a couple might be countered (each contact terminal by the side of drawing 1 and the back is not illustrated.). It protrudes so that the stanchion sections 14a, 14b, 14b, and 14a, and 15a, 15b, 15b and 15a may be countered near the edge by the side of a shorter side, respectively, and the stanchion sections 16 and 16 for positioning are protruded on the mid-position of the stanchion sections 14a and 15a, respectively.

[0009] And while the projected parts 19a and 19b for spring receptacles protrude, respectively among said stanchion section 16 and stanchion sections 14a and 15a which are located in the near side in drawing 1 , the bearing crevices 16a and 16a are established in the upper bed side of said stanchion sections 16 and 16.

[0010] Furthermore, electrical connection of the upper bed section of said stationary-contact terminal 11 is carried out through the leadframe which is not illustrated to stationary-contact 11a prepared in the upper bed side of stanchion section 14a, and electrical connection of the upper bed section of said stationary-contact terminal 12 is carried out to stationary-contact 12a prepared in the upper bed side of stanchion section 15a.

[0011] Furthermore, electrical connection is carried out to stationary-contact 13b by which the upper bed section was divided into two, electrical connection of one side was carried out to stationary-contact 13a prepared in the upper bed side of stanchion section 14b through the leadframe which is not illustrated, and the contact common terminal 13 established another side in the upper bed side of stanchion section 15b through the leadframe which is not illustrated.

[0012] Moreover, between said stanchion section 14a and stanchion section 15a, the insulating wall 17 is established, respectively. In addition, 18a is an end-winding larval tunnel.

[0013] As shown in drawing 4 , the electromagnet block 20 bends the center section of the iron core 21 of a cross-section abbreviation KO typeface, and forms crevice 21c for positioning of a cross-section abbreviation triangle. It is what fitted in and attached the permanent magnet 22 of a cross-section rectangle to crevice 21c of said iron core 21 located in the base of 23d of hollows which carried out insert molding

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of this to the spool 23, and were established in central flange 23a. While corner 22a of said permanent magnet 22 projects from the top face of central flange 23a of said spool 23 and left-hand side magnetic pole section 21a of an iron core 21 is exposed from the top face of flange 23b of said spool 23 Right-hand side magnetic pole section 21b of an iron core 21 is exposed from the top face of flange 23c of said spool 23.

[0014] Moreover, frame parts 24a and 24b are really fabricated by the lateral surface of said flanges 23b and 23c, respectively, and insert molding of the end-winding children 25 and 25 is carried out to this frame part 24a, respectively. And among drawing 4 , said end-winding child 25 tucks up, and the outgoing line of the coil 26 wound around said spool 23 is tucked up by section 25a (a near side tucks up and the section is not shown.), respectively, and is soldered to it. Since it tucks up in this example and section 25a projects from the inside of frame part 24a, there is an advantage of not becoming a failure at the time of attaching the electromagnet block 20.

[0015] In addition, although the board thickness of said iron core 21 is fixed, left-hand side magnetic pole section 21a and right-hand side magnetic pole section 21b have wide, and an adsorption area is large.

[0016] And the electromagnet block 20 is positioned above said base 10, and if it presses fit and carries out [tacking] of the end-winding child 25 to end-winding larval tunnel 18a, Stanchions 14b and 14b, and 15b and 15b project from frame parts 24a and 24b, respectively.

[0017] Moving iron 30 has the appearance of a flat-surface abbreviation rectangle, it constitutes the movable block 80 from the insulating frame 40, the load spring 50, and the movable contact segment block 60 which mention later, establishes the engagement slot 31 which serves as the rotation supporting point by ejection processing in an underside center section (drawing 4), and has made the taper side the underside of both ends 32a and 32b. Furthermore, said moving iron 30 has two caulking holes 33 which formed said engagement slot 31 so that it might counter by carrying out in between.

[0018] It protrudes the projections 43 and 43 for caulking of a couple on the top face while the insulating frame 40 has the shape of a cube type which can cover said moving iron 30, forms in both ends the loosely-fitting holes 41 and 42 which can fit loosely into the stanchion sections 14b and 15b of said base 10, respectively and has the projection for caulking (not shown) in the location corresponding to the underside with the caulking hole 33 of said moving iron 30. Moreover, the insulating frame 40 has formed shanks 44 and 44 in the center section of the lateral surface which counters.

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And both are united by inserting the caulking holes 33 and 33 of said moving iron 30 in the projection for caulking which the insulating frame 40 does not illustrate, respectively, and carrying out heat caulking to it.

[0019] Since stationary contacts 11a and 13a, and 12a and 13b are divided with partition piece 40a (drawing 2) allotted in the shape of [which forms the loosely-fitting hole 41 of the insulating frame 40 (42)] a Cush gear tooth, respectively according to this example, an insulating property is high.

[0020] And since connection unification is carried out by connection section 40b, the point of said partition piece 40a cannot deform easily. However, if continuation section 40b is only for acquiring a desired insulating property, it is not necessarily required.

[0021] Furthermore, since the insulating frame 40 divides the electromagnet block 20 and moving iron 30 from the movable contact segments 62 and 63 and stationary contacts 13a and 13b which are mentioned later, the distance for insulation is long and an insulating property is good.

[0022] Since protruding line 40c (drawing 3) prepared in the upper bed side of partition piece 40a especially located in the center divides stationary contacts 13a and 13a, and 13b and 13b, respectively, the insulating property after actuation and a return is good.

[0023] The load spring 50 is what pierced tabular spring material and was crooked, and while the elastic arms 51 and 52 of the couple which extends in an opposite direction can contact the projected parts 19a and 19b for spring receptacles of said base 10, respectively, they have the caulking holes 53 and 53 in the projected parts 43 and 43 for caulking of said insulating frame 40, and a corresponding location. In addition, the elastic arm 52 serves as wide from the elastic arm 51.

[0024] The movable contact segment block 60 is what carried out a total of four-sheet insert molding of every two movable contact segments 62 and 63 of the flat-surface abbreviation configuration for U characters, respectively, and was unified before and after the insulating stand 61 (drawing 2), and has formed the caulking holes 64 and 64 in the projected part 43 for caulking of said insulating frame 40, and the corresponding location in the center section of said insulating stand 61.

[0025] Said movable contact segment 62 divides the both ends into two at a cross direction, and traveling contact 62a is prepared in one edge underside, and it prepares traveling contact 62b in an other-end section underside. Moreover, the traveling contacts 63a and 63b as well as [the movable contact segment 63] said movable contact segment 62 are formed in the edge underside, respectively.

[0026] And by carrying out sequential insertion of the caulking holes 53 and 53 of the

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load spring 50, and the caulking holes 64 and 64 of an insulating stand 61, and carrying out heat caulking of the point of said projecting projected parts 43 and 43 to the projected parts 43 and 43 of said insulating frame 40, the insulating frame 40, the load spring 50, and the movable contact segment block 60 which unified moving iron 30 are united, and the movable block 80 is constituted.

[0027] Next, this is positioned in the upper part of said base 10, and if it fits into crevice 16a which formed the shank 44 of the insulating frame 40 in the stanchion section 16 of the base 10, while the engagement slot 31 of moving iron 30 engages with corner 22a of a permanent magnet 22 and moving iron 30 is supported rotatable, traveling contacts 62a and 62b, and 63a and 63b will counter stationary contacts 11a and 13a, and 12a and 13b respectively possible [attachment and detachment].

[0028] Thus, in the condition (drawing 3) of having attached, corner 22a of a permanent magnet 22, the engagement slot 31 of moving iron 30, and the elastic arms 51 and 52 of the hinge spring 50 will be mostly located on the same flat surface, and the excessive bending moment does not start, but smooth actuation etc. is obtained.

[0029] Moreover, according to this example, since traveling contacts 62a and 62b, and 63a and 63b are in the location which projected ahead more, the radius of gyration of the movable contact segments 62 and 63 is longer than the edges 32a and 32b of moving iron 30. For this reason, a contact can fully be opened and closed as the rotation include angle of moving iron 30 is small. Consequently, while there is little power consumption at high sensitivity, there is an advantage that the large electromagnetic relay of a contact gap is obtained. In addition, in this example, the shorter side side top face of a permanent magnet 22 was located near the moving iron 30 rather than the long side side top face, and the magnetic balance of the right and left to moving iron 30 has collapsed.

[0030] A case 70 has the shape of an abbreviation cube type which can fit into said base 10, and protrudes the projected parts 71 and 71 for location regulation on an inside corner.

[0031] And if a case 70 is fitted into the base 10, said projected parts 71 and 71 will fit loosely into the notching crevices 65 and 65 of the movable contact segment block 60, respectively, and will regulate the relief to the upper part of said movable block 80. Subsequently, after pouring a sealing compound 81 into the hollow fitted in and formed in the case 70 and solidifying at the base 10, an assembly activity is completed by extracting internal gas from the deflation hole which the base 10 does not illustrate, carrying out thermofusion of said deflation hole, and sealing it.

[0032] Next, actuation of the electromagnetic relay which consists of the

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above-mentioned configuration is explained. Since in the case of deenergisation the magnetic balance to moving iron 30 has collapsed as mentioned above, by the magnetic flux of a permanent magnet 22, left side edge section 32a of moving iron 30 sticks to wide left-hand side magnetic pole section 21a of an iron core 21, and is closing the magnetic circuit (drawing 3). For this reason, while the traveling contacts 62a and 62b of the movable contact segment 62 touch stationary contacts 11a and 13a, traveling contacts 63a and 63b open from stationary contacts 12a and 13b, and the elastic arm 51 is carrying out the pressure welding to projected part 19a of the base 10.

[0033] Next, if an electrical potential difference is impressed and excited in a coil 26 so that the magnetic flux which negates the magnetic flux of a permanent magnet 22 may arise, since right side edge section 32b of moving iron 30 will be attracted by right-hand side magnetic pole section 21b of an iron core 21 After resisting the magnetism of a permanent magnet 22, moving iron's 30 rotating corner 22a as the supporting point and left side edge section 32a of moving iron 30 opening from left-hand side magnetic pole section 21a of an iron core 21, right side edge section 32b of moving iron 30 sticks to right-hand side magnetic pole section 21b of an iron core 21. For this reason, after the traveling contacts 62a and 62b of the movable contact segment 62 open from stationary contacts 11a and 13a, while the traveling contacts 63a and 63b of the movable contact segment 63 contact stationary contacts 12a and 13b, the elastic arm 52 carries out a pressure welding to projected part 19b of the base 10.

[0034] And if excitation of said coil 26 is solved, according to the return force based on the spring force of the movable contact segments 63 and 63 and the spring force of the elastic arm 52 and the shorter side side top face of a permanent magnet 22 being closer to moving iron 30 than a long side side top face, moving iron 30 returns to the original location, and traveling contacts 62a and 62b, and 63a and 63b will change, and it will return to the original condition.

[0035] Since according to this example the movable contact segments 62 and 63 have the flat-surface abbreviation configuration for U characters and are made into the so-called double breaking method, the distance between contacts of stationary-contact 11a and traveling contact 62a is [/ the so-called single breaking method] good in one half. For this reason, the height dimension of an electromagnetic relay can be saved and equipment can be miniaturized.

[0036] Moreover, since the load spring 50 consists of elastic arms 51 and 52 which act independently at the time of actuation and a return, a desired load curve tends to

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obtain it by choosing both suitably. For this reason, it becomes that it is easy to make the load curve of the load spring 50 match with the abbreviation serpentine suction-force curve based on the electromagnet block 20, and there is an advantage that the degree of freedom of a design is large.

[0037] The 2nd example is the case where covered corner 22a of a permanent magnet 22 with the thin meat material 27, and moving iron 30 is supported free [rotation] through this thin meat material 27 to being the case where the 1st above-mentioned example engaged the engagement slot 31 of moving iron 30 with corner 22a of a permanent magnet 22 directly, and supports rotatable, as shown in drawing 5 and drawing 6 .

[0038] While the thin meat material 27 of this example protects corner 22a of the brittle permanent magnet 22, the stainless steel plate and polyester film for securing smooth rotation actuation which it is and are nonmagnetic material as thin meat material, for example are mentioned.

[0039] In addition, in this example, since central flange 23a of spool 23 is made higher than other flanges 23b and 23c and the level difference is prepared, the rotation include angle of moving iron 30 becomes larger than the 1st example, and there is an advantage that a big stroke is obtained. Since others are the same as that of the 1st above-mentioned example almost, explanation is omitted.

[0040] In addition, although the above-mentioned example explained the case where a shank 44 was really fabricated to the insulating frame 40, it may not necessarily carry out insert molding, using not only this but the metal round bar as a shank. Moreover, it is not necessary to fix the end section to the same side face as a shank 44, you may fix to a different side face, and, as for the load spring 50, on the other hand, it is needless to say that you may make it the other end of the load spring 50 contact, not only the base 10 but other fixing components 20, for example, an electromagnet block.

[0041]

[Effect of the Invention] Since according to claim 1 concerning this invention a permanent magnet is leaned to an iron core and it has attached to it so that clearly from the above explanation, the suction force over the moving iron on the top face of both sides which forms the corner of a permanent magnet became out of balance, and magnetic balance has collapsed. For this reason, it becomes unnecessary to bend the end section of an iron core horizontally, and manufacture of a component part becomes easy. Since it is not necessary to bend the end section of an iron core even if equipment is miniaturized especially, the variation in the operating characteristic by the variation in components precision like the conventional example is lost. Moreover,

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since according to claim 2 the engagement slot established in moving iron engages with the corner of a permanent magnet, moving iron cannot shift easily and a backlash does not arise in moving iron, an operating characteristic is stable. Furthermore, according to claim 3, since it fits in and the corner of a permanent magnet is positioned to the crevice of a cross-section abbreviation triangle, assembly becomes easy and assembly precision improves. And since the touch area of an iron core and a permanent magnet is large, magnetic reluctance becomes small, the leak of magnetic flux decreases, and magnetic effectiveness improves. And according to claim 4, since the corner of a brittle permanent magnet is covered with thin meat material, it is hard coming to generate a chip in a permanent magnet, and friction decreases by thin meat material, rotation of moving iron becomes smooth a life is not only extended, but, and it is effective in an operating characteristic improving further.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the decomposition perspective view showing the 1st example of the electromagnetic relay concerning this invention.

[Drawing 2] It is the flat-surface sectional view showing the 1st example of the electromagnetic relay concerning this invention.

[Drawing 3] It is the transverse-plane sectional view showing the 1st example of the electromagnetic relay concerning this invention.

[Drawing 4] It is the important section decomposition sectional view showing the 1st example of the electromagnetic relay concerning this invention.

[Drawing 5] It is the decomposition perspective view showing the 2nd example of the electromagnetic relay concerning this invention.

[Drawing 6] It is the important section decomposition sectional view showing the 2nd example of the electromagnetic relay concerning this invention.

[Drawing 7] It is the outline sectional view showing the magnetic circuit of the electromagnetic relay concerning the conventional example.

[Description of Notations]

20 [-- The crevice for positioning, 22 / -- A permanent magnet, 22a / -- A corner, 30 / -- Moving iron, 31 / -- Engagement slot.] -- An electromagnet block, 21 -- An iron core, 21a, 21b -- The magnetic pole section, 21c

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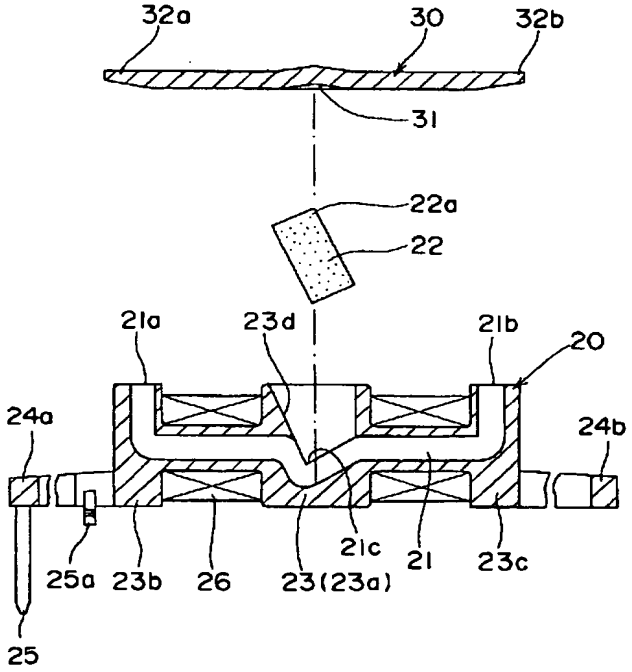
(54)【発明の名称】　電磁継電器

(57)【要約】
【目的】　構成部品の製造が容易で動作特性が均一な電磁継電器を提供することを目的とする。
【構成】　断面略コ字形の鉄芯２１の中央部を折り曲げて断面略三角形の位置決め用凹部２１ｃを形成する。この鉄芯２１をインサート成形したスプール２３の中央鍔部２３ａに凹所２３ｃを形成する。この凹所２３ｃの底面に位置する鉄芯２１の凹部２１ｃに断面長方形の永久磁石２２を嵌合して組み付ける。そして、前記永久磁石２２の角部２２ａに可動鉄片３０の下面に設けた係合溝３１を係合し、可動鉄片３０を回動自在に支持する。



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【特許請求の範囲】
【請求項１】　鉄芯に組み付けた断面方形の永久磁石に可動鉄片を回動自在に支持した電磁継電器において、前記鉄芯に傾けて組み付けた永久磁石の角部に、可動鉄片を回動自在に支持したことを特徴とする電磁継電器。
【請求項２】　前記可動鉄片の片面に設けた係合溝を前記永久磁石の角部に係合して回動自在に支持したことを特徴とする請求項１に記載の電磁継電器。
【請求項３】　前記鉄芯の片面に設けた断面略三角形の位置決め用凹部に前記永久磁石の角部を嵌合したことを特徴とする請求項１または２に記載の電磁継電器。
【請求項４】　前記永久磁石の角部を被覆する薄肉材を介して可動鉄片を回動自在に支持したことを特徴とする請求項１ないし３のいずれか１項に記載の電磁継電器。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は電磁継電器、特に、磁気回路を構成する永久磁石の取付構造に関する。
【０００２】
【従来の技術】従来、電磁継電器の磁気回路としては、例えば、図７に示すように、略コ字形鉄芯１の中央部に配した永久磁石２の上面中央部に可動鉄片３の支持突部４を載置して回動自在に支持し、前記鉄芯１に巻回したコイル５に電圧を印加して励磁することにより、前記可動鉄片３を回動し、その両端部３ａ，３ｂを前記鉄芯１の両端部１ａ，１ｂに交互に接離するようにしたものがある。なお、前述の電磁継電器では、自己復帰型とするため、前記鉄芯１の一端部１ａを水平方向に折り曲げることにより、吸着面積を異ならしめ、磁気バランスをくずしている。
【０００３】
【発明が解決しようとする課題】しかしながら、前述の電磁継電器では、鉄芯１の一端部１ａを水平方向に正確に折り曲げねばならないので、製造に手間がかかる。特に、装置の小型化につれて前述の折り曲げ加工が著しく困難となり、部品精度にバラツキが生じやすく、これが動作特性に悪影響を与えるという問題点がある。
【０００４】本発明は、前記問題点に鑑み、構成部品の製造が容易で動作特性が均一な電磁継電器を提供することを目的とする。
【０００５】
【課題を解決するための手段】本発明にかかる電磁継電器は、前記目的を達成するため、鉄芯に組み付けた断面方形の永久磁石に可動鉄片を回動自在に支持した電磁継電器において、前記鉄芯に傾けて組み付けた永久磁石の角部に、可動鉄片を回動自在に支持したものである。また、前記可動鉄片は、その片面に設けた係合溝を前記永久磁石の角部に係合して回動自在に支持したものであってもよい。さらに、前記鉄芯は、その片面に設けた断面略三角形の位置決め用凹部に前記永久磁石の角部を嵌合して組み付けてもよい。そして、前記永久磁石の角部を被覆する薄肉材を介して前記可動鉄片を回動自在に支持してもよい。

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【０００６】
【作用】したがって、本発明にかかる請求項１によれば、断面方形の永久磁石の角部を支点に可動鉄片が回動することになる。また、請求項２によれば、前記永久磁石の角部に係合する係合溝を介して可動鉄片が回動自在に支持されることになる。さらに、請求項３によれば、鉄芯に設けた断面略三角形の位置決め用凹部に永久磁石が所定の傾きで組み付けられることになる。そして、請求項４によれば、薄肉材を介して永久磁石の角部に可動鉄片が回動自在に支持されることになる。
【０００７】
【実施例】次に、本発明にかかる実施例を図１ないし図６の添付図面に従って説明する。第１実施例にかかる電磁継電器は、図１ないし図４に示すように、大略、ベース１０、電磁石ブロック２０、可動ブロック８０を構成する可動鉄片３０、絶縁枠体４０、負荷ばね５０、および、可動接触片ブロック６０、ケース７０からなるものである。
【０００８】ベース１０は平面略長方形を有し、固定接点端子１１および共通接点端子１３を一組ずつ対称にインサート成形するとともに、一対の固定接点端子１２を対向するように上方から圧入したもので（第１図、奥側の各接点端子は図示せず。）、短辺側の縁部近傍に支柱部１４ａ，１４ｂ，１４ｂ，１４ａおよび１５ａ，１５ｂ，１５ｂ，１５ａをそれぞれ対向するように突設し、また、支柱部１４ａ，１５ａの中間位置に位置決め用支柱部１６，１６をそれぞれ突設してある。
【０００９】そして、図１中の手前側に位置する前記支柱部１６と支柱部１４ａ，１５ａとの間にばね受け用突部１９ａ，１９ｂがそれぞれ突設されているとともに、前記支柱部１６，１６の上端面には軸受け凹部１６ａ，１６ａが設けられている。
【００１０】さらに、前記固定接点端子１１の上端部は支柱部１４ａの上端面に設けた固定接点１１ａに図示しないリードフレームを介して電気接続され、前記固定接点端子１２の上端部は支柱部１５ａの上端面に設けた固定接点１２ａに電気接続されている。
【００１１】さらに、共通接点端子１３は上端部が２つに分れ、一方は図示しないリードフレームを介して支柱部１４ｂの上端面に設けた固定接点１３ａに電気接続され、他方は図示しないリードフレームを介して支柱部１５ｂの上端面に設けた固定接点１３ｂに電気接続されている。
【００１２】また、前記支柱部１４ａと支柱部１５ａとの間には絶縁壁１７がそれぞれ設けられている。なお、１８ａはコイル端子孔である。
【００１３】電磁石ブロック２０は、図４に示すよう

に、断面略コ字形の鉄芯２１の中央部を折り曲げて断面略三角形の位置決め用凹部２１ｃを形成し、これをスプール２３にインサート成形し、中央鍔部２３ａに設けた凹所２３ｄの底面に位置する前記鉄芯２１の凹部２１ｃに断面長方形の永久磁石２２を嵌合して組み付けたもので、前記永久磁石２２の角部２２ａが前記スプール２３の中央鍔部２３ａの上面から突出する一方、鉄芯２１の左側磁極部２１ａが前記スプール２３の鍔部２３ｂの上面から露出しているとともに、鉄芯２１の右側磁極部２１ｂが前記スプール２３の鍔部２３ｃの上面から露出している。

【００１４】また、前記鍔部２３ｂ，２３ｃの外側面には枠部２４ａ，２４ｂがそれぞれ一体成形され、この枠部２４ａには、コイル端子２５，２５がそれぞれインサート成形されている。そして、前記スプール２３に巻回されたコイル２６の引き出し線が、図４中、前記コイル端子２５のからげ部２５ａ（手前側のからげ部は図示せず。）にそれぞれからげられ、半田付けされている。本実施例ではからげ部２５ａが枠部２４ａの内側から突出しているので、電磁石ブロック２０を組み付ける際の障害にならないという利点がある。

【００１５】なお、前記鉄芯２１の板厚は一定であるが、左側磁極部２１ａおよび右側磁極部２１ｂが巾広となっており、吸着面積が広い。

【００１６】そして、前記ベース１０の上方に電磁石ブロック２０を位置決めし、コイル端子２５をコイル端子孔１８ａに圧入して仮止めすると、枠部２４ａおよび２４ｂから支柱１４ｂ，１４ｂおよび１５ｂ，１５ｂがそれぞれ突出する。

【００１７】可動鉄片３０は平面略長方形の外形を有し、後述する絶縁枠体４０、負荷ばね５０および可動接触片ブロック６０で可動ブロック８０を構成するもので、下面中央部に突き出し加工で回動支点となる係合溝３１を設け（図４）、両端部３２ａ，３２ｂの下面をテーパ面としてある。さらに、前記可動鉄片３０は前記係合溝３１を間にして対向するように設けた２個のカシメ孔３３を有している。

【００１８】絶縁枠体４０は前記可動鉄片３０を覆うことができる箱形状を有し、両端部に、前記ベース１０の支柱部１４ｂ，１５ｂにそれぞれ遊嵌可能な遊嵌孔４１，４２を形成し、その下面に、前記可動鉄片３０のカシメ孔３３と対応する位置にカシメ用突起（図示せず）を有するとともに、その上面に、一対のカシメ用突起４３，４３を突設している。また、絶縁枠体４０は対向する外側面の中央部に軸部４４，４４を設けてある。そして、絶縁枠体４０の図示しないカシメ用突起に前記可動鉄片３０のカシメ孔３３，３３をそれぞれ挿通し、熱カシメすることにより、両者が一体となる。

【００１９】本実施例によれば、絶縁枠体４０の遊嵌孔４１（４２）を形成するクシ歯状に配した仕切り片４０ａ（図２）で、固定接点１１ａ，１３ａおよび１２ａ，１３ｂがそれぞれ仕切られているので、絶縁特性が高い。

【００２０】しかも、前記仕切り片４０ａの先端部は連結部４０ｂで連結一体化されているので、変形しにくい。ただし、連続部４０ｂは、所望の絶縁特性を得るためだけであれば、必ずしも必要でない。

【００２１】さらに、絶縁枠体４０が電磁石ブロック２０および可動鉄片３０を、後述する可動接触片６２，６３および固定接点１３ａ，１３ｂから仕切るので、絶縁距離が長く、絶縁特性が良い。

【００２２】特に、中央に位置する仕切り片４０ａの上端面に設けた突条４０ｃ（図３）が固定接点１３ａ，１３ａおよび１３ｂ，１３ｂをそれぞれ仕切るので、動作後，復帰後の絶縁特性が良い。

【００２３】負荷ばね５０は板状ばね材を打ち抜いて屈曲したもので、反対方向に延在する一対の弾性腕部５１，５２は前記ベース１０のばね受け用突部１９ａ，１９ｂにそれぞれ当接可能である一方、前記絶縁枠体４０のカシメ用突部４３，４３と対応する位置にカシメ孔５３，５３を有している。なお、弾性腕部５２は弾性腕部５１よりも巾広となっている。

【００２４】可動接触片ブロック６０は絶縁台６１の前後に平面略Ｕ字形状の可動接触片６２，６３をそれぞれ２枚ずつ、計４枚インサート成形して一体化したもので（図２）、前記絶縁台６１の中央部には前記絶縁枠体４０のカシメ用突部４３と対応する位置にカシメ孔６４，６４を設けてある。

【００２５】前記可動接触片６２はその両端部を巾方向に２分割し、一方の端部下面に可動接点６２ａを、他方の端部下面に可動接点６２ｂを設けたものである。また、可動接触片６３も前記可動接触片６２と同様に可動接点６３ａ，６３ｂを端部下面にそれぞれ設けてある。

【００２６】そして、前記絶縁枠体４０の突部４３，４３に負荷ばね５０のカシメ孔５３，５３および絶縁台６１のカシメ孔６４，６４を順次挿通し、突出する前記突部４３，４３の先端部を熱カシメすることにより、可動鉄片３０を一体化した絶縁枠体４０、負荷ばね５０および可動接触片ブロック６０が一体となって可動ブロック８０を構成する。

【００２７】次に、これを前記ベース１０の上方で位置決めし、絶縁枠体４０の軸部４４をベース１０の支柱部１６に設けた凹部１６ａに嵌合すると、永久磁石２２の角部２２ａに可動鉄片３０の係合溝３１が係合し、可動鉄片３０が回動可能に支持されるとともに、可動接点６２ａ，６２ｂおよび６３ａ，６３ｂが固定接点１１ａ，１３ａおよび１２ａ，１３ｂにそれぞれ接離可能に対向する。

【００２８】このように組み付けた状態（図３）では、永久磁石２２の角部２２ａ、可動鉄片３０の係合溝３１およびヒンジばね５０の弾性腕部５１，５２がほぼ同一

平面上に位置することになり、余分な曲げモーメントがかからず、円滑な動作等が得られる。

【００２９】また、本実施例によれば、可動鉄片３０の端部３２ａおよび３２ｂよりも、可動接点６２ａ，６２ｂおよび６３ａ，６３ｂがより前方に突出した位置にあるので、可動接触片６２，６３の回転半径が長い。このため、可動鉄片３０の回動角度が小さくとも、接点を十分に開閉できる。この結果、高感度で消費電力が少ないとともに、接点ギャップの大きい電磁継電器が得られるという利点がある。なお、本実施例では、永久磁石２２の短辺側上面が長辺側上面よりも可動鉄片３０の近傍に位置し、可動鉄片３０に対する左右の磁気バランスがくずれている。

【００３０】ケース７０は前記ベース１０に嵌合可能な略箱形状を有し、内側角部に位置規制用突部７１，７１を突設している。

【００３１】そして、ベース１０にケース７０を嵌合すると、前記突部７１，７１が可動接触片ブロック６０の切り欠き凹部６５，６５にそれぞれ遊嵌し、前記可動ブロック８０の上方への浮き上がりを規制する。ついで、ベース１０にケース７０を嵌合して形成された凹所にシール剤８１を注入，固化した後、ベース１０の図示しないガス抜き孔から内部のガスを抜き、前記ガス抜き孔を熱溶融して密封することにより、組み立て作業が完了する。

【００３２】次に、前述の構成からなる電磁継電器の動作について説明する。無励磁の場合、前述したように可動鉄片３０に対する磁気バランスがくずれているので、永久磁石２２の磁束により、可動鉄片３０の左側端部３２ａが鉄芯２１の巾広の左側磁極部２１ａに吸着して磁気回路を閉成している（図３）。このため、可動接触片６２の可動接点６２ａ，６２ｂが固定接点１１ａ，１３ａに接触している一方、可動接点６３ａ，６３ｂが固定接点１２ａ，１３ｂから開離し、弾性腕部５１がベース１０の突部１９ａに圧接している。

【００３３】次に、永久磁石２２の磁束を打消す磁束が生じるようにコイル２６に電圧を印加して励磁すると、可動鉄片３０の右側端部３２ｂが鉄芯２１の右側磁極部２１ｂに吸引されるので、永久磁石２２の磁力に抗し、可動鉄片３０が角部２２ａを支点として回動し、可動鉄片３０の左側端部３２ａが鉄芯２１の左側磁極部２１ａから開離した後、可動鉄片３０の右側端部３２ｂが鉄芯２１の右側磁極部２１ｂに吸着する。このため、可動接触片６２の可動接点６２ａ，６２ｂが固定接点１１ａ，１３ａから開離した後、可動接触片６３の可動接点６３ａ，６３ｂが固定接点１２ａ，１３ｂに接触するとともに、弾性腕部５２がベース１０の突部１９ｂに圧接する。

【００３４】そして、前記コイル２６の励磁を解くと、可動接触片６３，６３のばね力と弾性腕部５２のばね力とに基づく復帰力および永久磁石２２の短辺側上面が長辺側上面よりも可動鉄片３０に近いことにより、可動鉄片３０が元の位置に復帰し、可動接点６２ａ，６２ｂおよび６３ａ，６３ｂが切り替り、元の状態に復帰する。

【００３５】本実施例によれば、可動接触片６２，６３が平面略Ｕ字形状を有し、いわゆるダブルブレーク方式としてあるので、いわゆるシングルブレーク方式と比べ、例えば、固定接点１１ａと可動接点６２ａとの接点間距離が半分で良い。このため、電磁継電器の高さ寸法を節約でき、装置を小型化できる。

【００３６】また、負荷ばね５０は、動作時および復帰時において別々に作用する弾性腕部５１，５２からなるものであるので、両者を適宜選択することにより、所望の負荷曲線が得やすい。このため、電磁石ブロック２０に基づく略Ｓ字形状の吸引力曲線に負荷ばね５０の負荷曲線をマッチングさせやすくなり、設計の自由度が大きいという利点がある。

【００３７】第２実施例は、図５および図６に示すように、前述の第１実施例が永久磁石２２の角部２２ａに可動鉄片３０の係合溝３１を直接係合して回動可能に支持した場合であるのに対し、永久磁石２２の角部２２ａを薄肉材２７で被覆し、この薄肉材２７を介して可動鉄片３０を回動自在に支持した場合である。

【００３８】本実施例の薄肉材２７は、脆弱な永久磁石２２の角部２２ａを保護するとともに、円滑な回動動作を確保するためのものであり、薄肉材としては、例えば、非磁性材であるステンレス鋼板やポリエステルフィルムが挙げられる。

【００３９】なお、本実施例では、スプール２３の中央鍔部２３ａを他の鍔部２３ｂ，２３ｃよりも高くして段差を設けてあるので、可動鉄片３０の回動角度が第１実施例よりも大きくなり、大きなストロークが得られるという利点がある。他は前述の第１実施例とほぼ同様であるので、説明を省略する。

【００４０】なお、前述の実施例では、軸部４４を絶縁枠体４０に一体成形する場合について説明したが、必ずしもこれに限らず、金属製の丸棒を軸部としてインサート成形してもよい。また、負荷ばね５０は、その一端部を軸部４４と同一側面に固定する必要はなく、異なる側面に固定してもよく、一方、負荷ばね５０の他端部は、ベース１０に限らず、他の固定部品、例えば、電磁石ブロック２０に当接するようにしてもよいことは勿論である。

【００４１】

【発明の効果】以上の説明から明らかなように、本発明にかかる請求項１によれば、鉄芯に永久磁石を傾けて組み付けてあるので、永久磁石の角部を形成する両側上面の可動鉄片に対する吸引力が不均衡となり、磁気バランスがくずれている。このため、鉄芯の一端部を水平方向に折り曲げる必要がなくなり、構成部品の製造が容易に

なる。特に、装置が小型化しても、鉄芯の一端部を折り曲げる必要がないので、従来例のような部品精度のバラツキによる動作特性のバラツキがなくなる。また、請求項２によれば、可動鉄片に設けた係合溝が永久磁石の角部に係合し、可動鉄片がずれにくく、可動鉄片にガタツキが生じないので、動作特性が安定化する。さらに、請求項３によれば、断面略三角形の凹部に永久磁石の角部を嵌合して位置決めするので、組立が容易となり、組立精度が向上する。しかも、鉄芯と永久磁石との接触面積が大きいので、磁気抵抗が小さくなり、磁束の洩れが少なくなり、磁気効率が向上する。そして、請求項４によれば、脆弱な永久磁石の角部が薄肉材で被覆されるので、永久磁石に欠けが生じにくくなり、寿命が伸びるだけでなく、薄肉材によって摩擦が減少し、可動鉄片の回動が円滑になり、動作特性がより一層向上するという効果がある。

【図面の簡単な説明】

【図１】　本発明にかかる電磁継電器の第１実施例を示す分解斜視図である。

【図２】　本発明にかかる電磁継電器の第１実施例を示す平面断面図である。

【図３】　本発明にかかる電磁継電器の第１実施例を示す正面断面図である。

【図４】　本発明にかかる電磁継電器の第１実施例を示す要部分解断面図である。

【図５】　本発明にかかる電磁継電器の第２実施例を示す分解斜視図である。

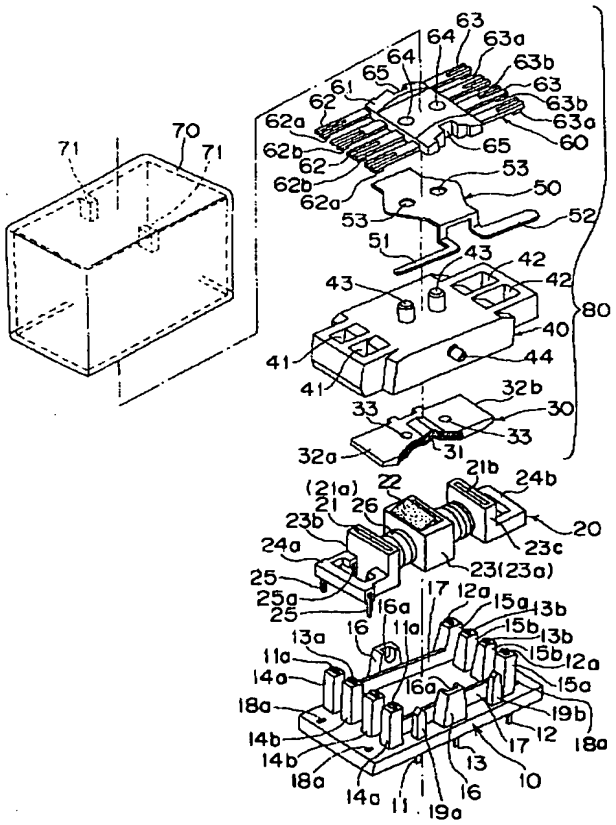
【図６】　本発明にかかる電磁継電器の第２実施例を示す要部分解断面図である。

【図７】　従来例にかかる電磁継電器の磁気回路を示す概略断面図である。

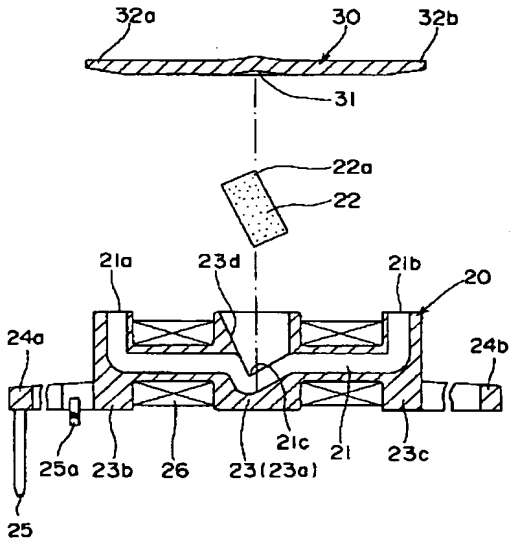
【符号の説明】

２０…電磁石ブロック、２１…鉄芯、２１ａ，２１ｂ…磁極部、２１ｃ…位置決め用凹部、２２…永久磁石、２２ａ…角部、３０…可動鉄片、３１…係合溝。

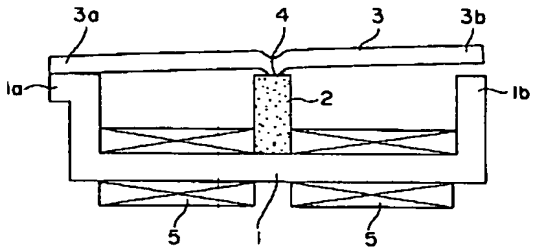
【図１】



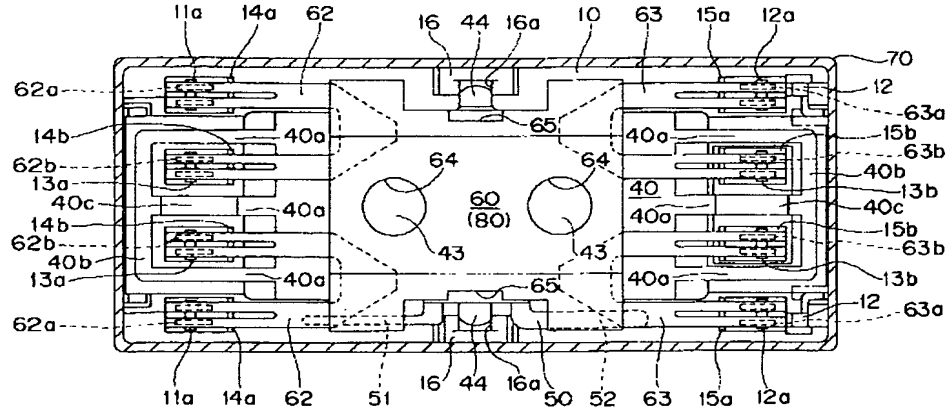
【図４】



【図７】



【図２】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10
63
15a
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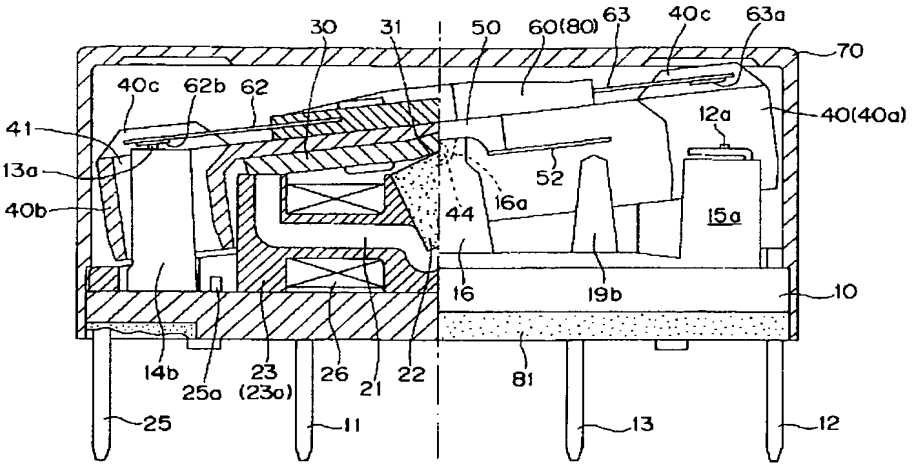
70
62a
14b
62b
13a
40c
40b
40a
64
60
(80)
43
65
40
12
63a
15b
63b
13b
51
50
52

【図３】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31
50
60(80)
63
40c
63a
70
40c
62b
62
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40(40a)
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16a
44
15a
16
19b
10
14b
25a
23
(23a)
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81
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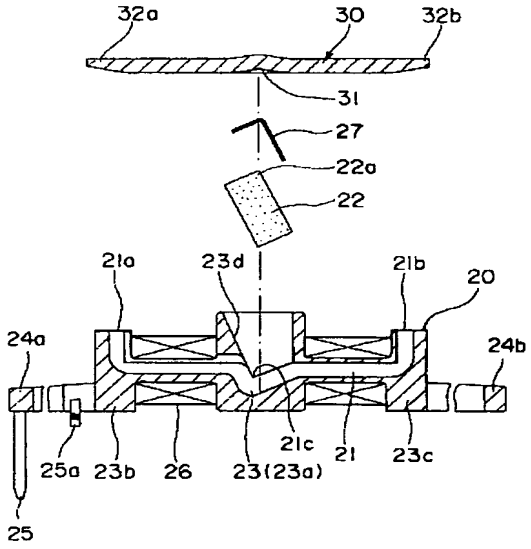
11
13
12

【図６】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22a
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21a
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24b
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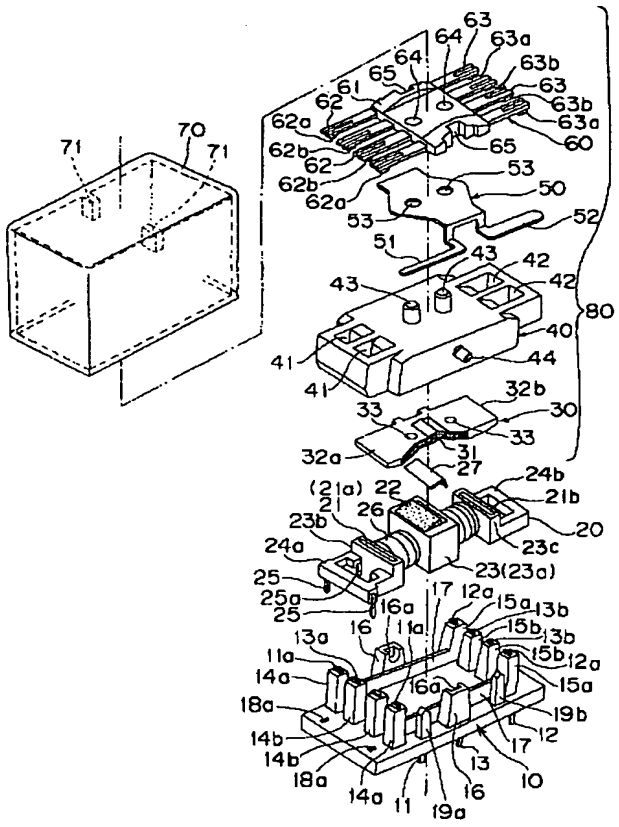
23b
26
23(23a)
21c
21
23c
25

【図５】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24b
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21b
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23c
23(23a)
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